Citation:

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Modelling mode choice in the Mobidrive survey

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Setting and issues

Mode choice is:

- Interdependent on previous and coming trips within a journey
- Interdependent on previous and coming journeys
- Interdependent on interactions within the household

Current practise is

- to model it trip by trip
- to ignore the interdependencies

Does it make a difference ?

Possible approaches

Basis:

- Random utility choice models

Extension of the modelling framework:

- Serial correlation between choices

Redefinition of the choice object:

- Journeys, instead of trips

Selection of the sample

- Minimise the impacts of the interdependencies

Data set: Mobidrive

Study for the German Ministry of Research and Technology

- 6 week continuous diary
- 360 persons (singles, couples, families)
- Spring and fall of 1999
- Karlsruhe and Halle

- About 150 trips per person

Travel time calculation and imputation

Two alternatives:

- Stated travel times from diary for chosen alternatives
- Network-based travel times between geocoded locations
  - map&guide for road traffic
  - Hafas for public transport (including transfers and access)

Imputation of walking and cycling using age, sex and distance specific speeds and network shortest-path distances

Data selection

Step	Sample size
All trips	52‘300
Only Karlsruhe (Pretest and main study)	31‘300
Fully geocoded	17‘800
No motorcycles, missing income and transfers	12‘700
Only simple journeys (only two trips)	7‘400
Only outward trips	3‘700
Only permissable modes (no car sharing)	3‘450

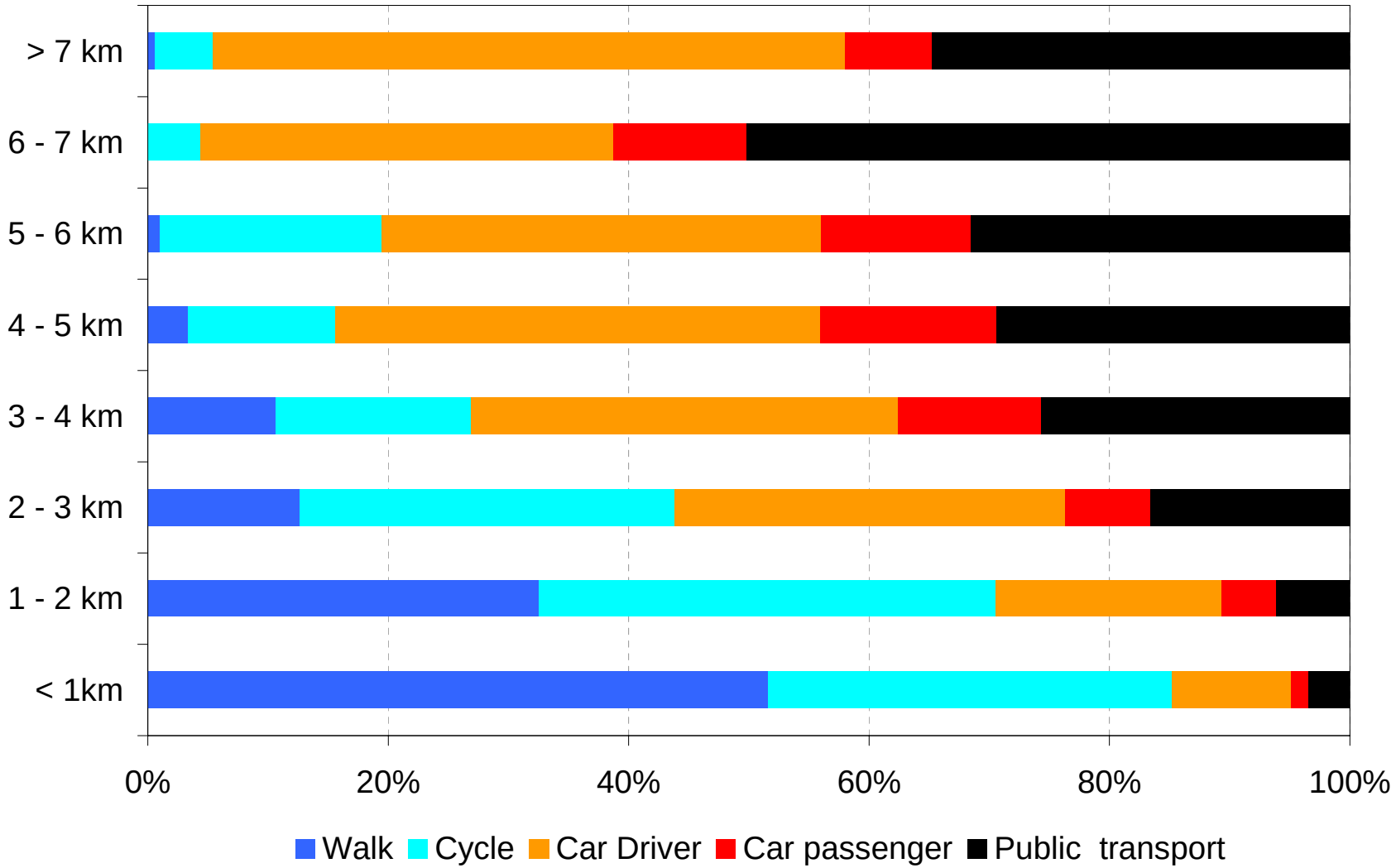
Modelling approach

Multinomial logit (MNL)

- Attention to functional form
- Attention to situation
- Attention to socio-demographics

- Disregard of error structures at this stage

Modal shares by distance (Simple journeys)



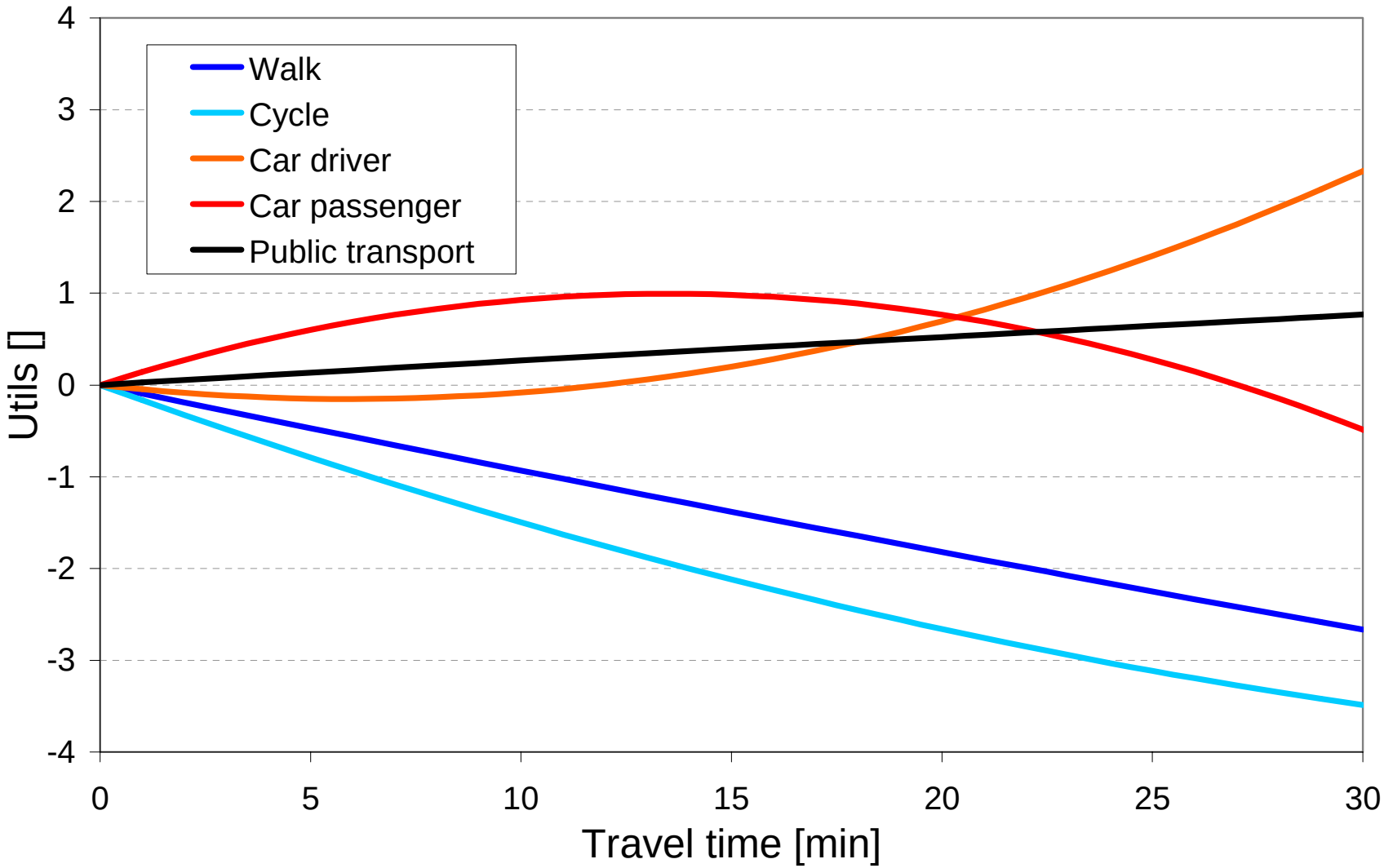
Model evolution

Model		Log likelihood
	Null model	-5‘570
1	Constants only	-4‘750
2	1 + Generic linear travel time	-4‘510
3	2 + ASC linear travel time	-4‘150
4	2 + ASC linear and quadratic travel time	-4‘070
5	4 + Socio-demographics	-3‘590
6	5 + situational description	-3‘450

Final model: modal characteristics

Variable	Parameter	t-Test
Walking time	-0.09534	-16.3
Walking time squared	0.00021	12.9
Cycling time	-0.16645	-14.1
Cycling time squared	0.00167	9.8
Driving time	-0.05122	-1.3
Driving time sqared	0.00430	2.4
Car passenger time	0.14728	2.2
Car passenger time squared	-0.00545	-1.8
In-vehicle time	0.02720	4.5
In-vehicle time squared	-0.00005	-3.2

Final model: Modal characteristics



Final model: Socio-demographics

Variable	Parameter	t-Test
Walk – Age	-0.12559	-8.6
Walk – Age squared	0.00130	8.0
Cycle - Age	-0.14355	-10.4
Cycle – Age squared	0.00156	9.9
Car – Car availability	1.44686	13.2
Car passenger - Male	-1.83147	-8.9
Public transport - Season	2.35287	19.1
Public transport - Income	1.04886	7.8
Public transport – Income squared	-0.09203	-7.7

Final model: Socio-demographics

Variable	Parameter	t-Test
Walk – Private business	0.714	4.6
Walk – Daily shopping	0.504	3.6
Cycle - Daylight	0.327	2.3
Cycle - Work	2.375	8.3
Car - Escorting	1.384	7.0
Car - Work	1.440	5.1
Car passenger - Leisure	0.862	5.8
Public transport - Work	1.805	6.2

Conclusions and outlook

Substantial points

- Structure of travel time influence
- Impact of pre-commitments
- Situational impacts

Methodological points

- Modelling complex journeys
- Use of more complex error structures
- Accommodating serial correlations

Logit-Model

Basic assumption: Utility U_{jq} of alternative j for person q:

$$U_{jq} = U(X_{kjq}) = V(X_{kjq}) + \varepsilon_{jq}$$

$V(X_{kjq})$	Systematic utility
ε_{jq}	Non systematic, unobservable share

$$V(X_{kjq}) = \alpha_j + \sum \beta_{k''j}\, p_{k''q} + \sum \beta_{k'j}\, s_{k'q} + \sum \beta_{kj}\, x_{kjq}$$

α_j	Constant
$p_{k''q}$	Characteristic k'' = 1...m'' of person q
$s_{k'q}$	Characteristic k' = m''+1...m' of situation for person q
x_{kjq}	Characteristic k = m'+1...m of alternative j for person q